

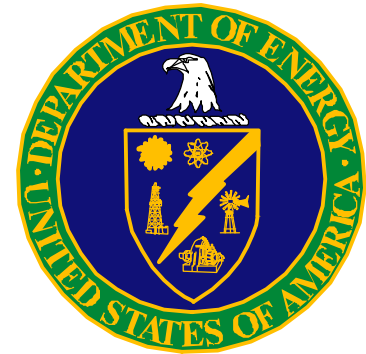
Science and Technology Contributions to Improving Worker Safety and Health

by Gerald Boyd, Randal Scott, and Donald Oakley

Presented to:

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Randal S. Scott

Director

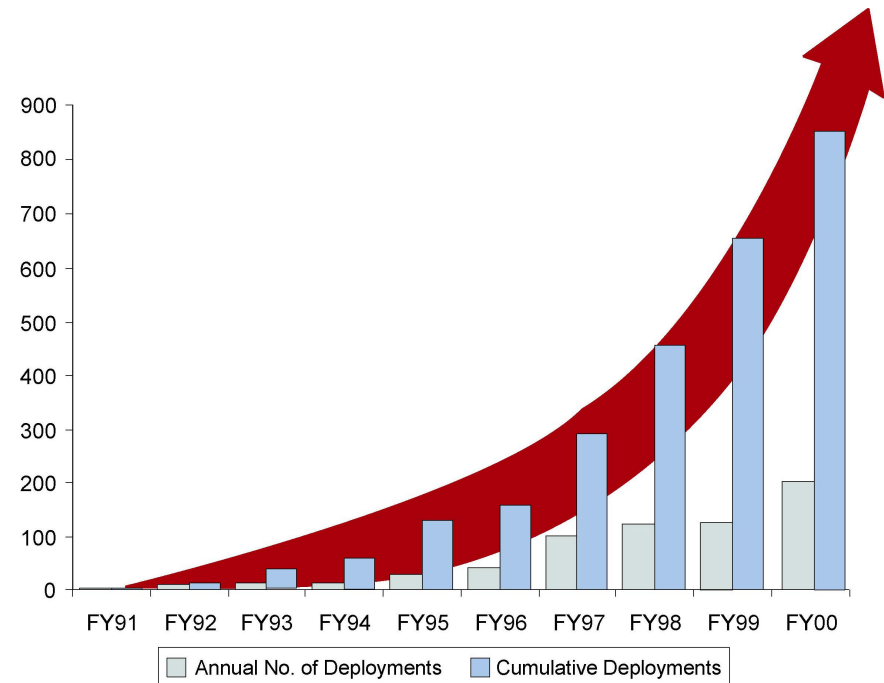
Office of Safety, Health, and Security

Office of Environmental Management

Safety and Health is a High Priority in Science and Technology

EM's Six Guiding Principles

- Protecting workers, the public, and the environment
- Reducing long-term safety risks
- Bringing Science and Technology expertise to bear on individual projects
- Strengthening program and project management to ensure the Department is getting the most for the taxpayer dollar
- Earning the public's confidence that the Department will meet its responsibilities
- Building Long-term Stewardship into cleanup plans



"I see the integration of science and technology with worker safety and health as one of the best ways to successfully meet the challenges confronting the EM program." – Carolyn Huntoon

Over 280 Science and Technology Sponsored Technologies are Making Valuable Contributions in Cleanup Activities Across the DOE Complex

Enhanced Sludge Washing at Hanford

\$5B reduction in cost by removing contaminants from highly radioactive sludge

Reactor Interim Safe Storage at Hanford

\$500M cost savings by decontamination and decommissioning the remaining 7 Reactors for long-term safe storage

Reactor Facility D&D at Idaho

Large-scale technological deployments for inspecting, characterizing, decontaminating, and dismantling facilities using Remote Underwater Characterization System, Oxy-gasoline Torch and Soft-sided Waste Containers

Technical Assistance teams accessed subsurface contamination at the Pantex and Paducah Sites and made recommendations on paths forward for remediation

Groundwater Injection System at Fernald

\$3B reduction in cost for groundwater cleanup by accelerating schedule from 2015 to 2006

Gunite Tanks Cleanup at Oak Ridge

\$350M savings using an integrated waste retrieval and treatment system (Robotic Crawler, Robotic Arm, Waste Dislodging and Conveyance Tool)

Purge Water Management at Savannah River

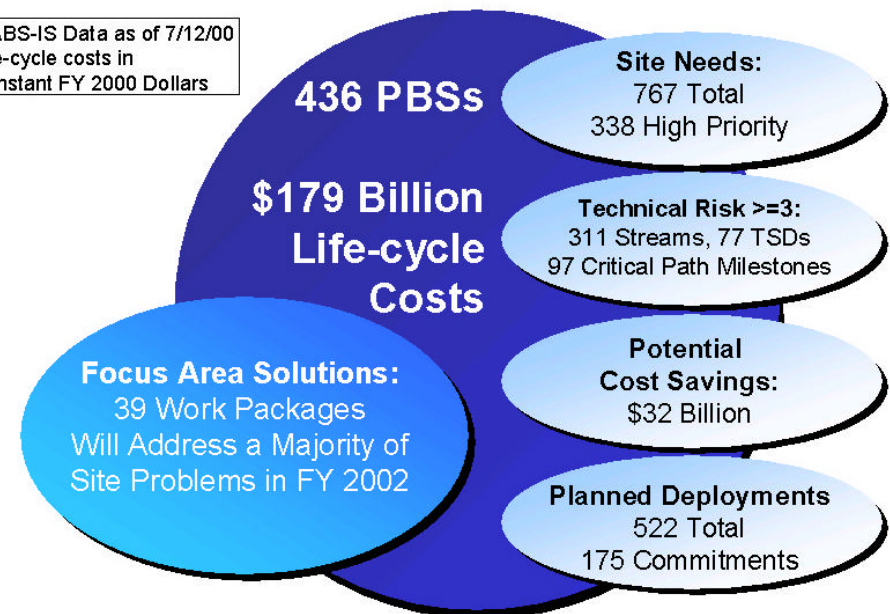
Cost avoidance of \$400K annually by collecting and returning purge water to the originating aquifer during monitoring well sampling



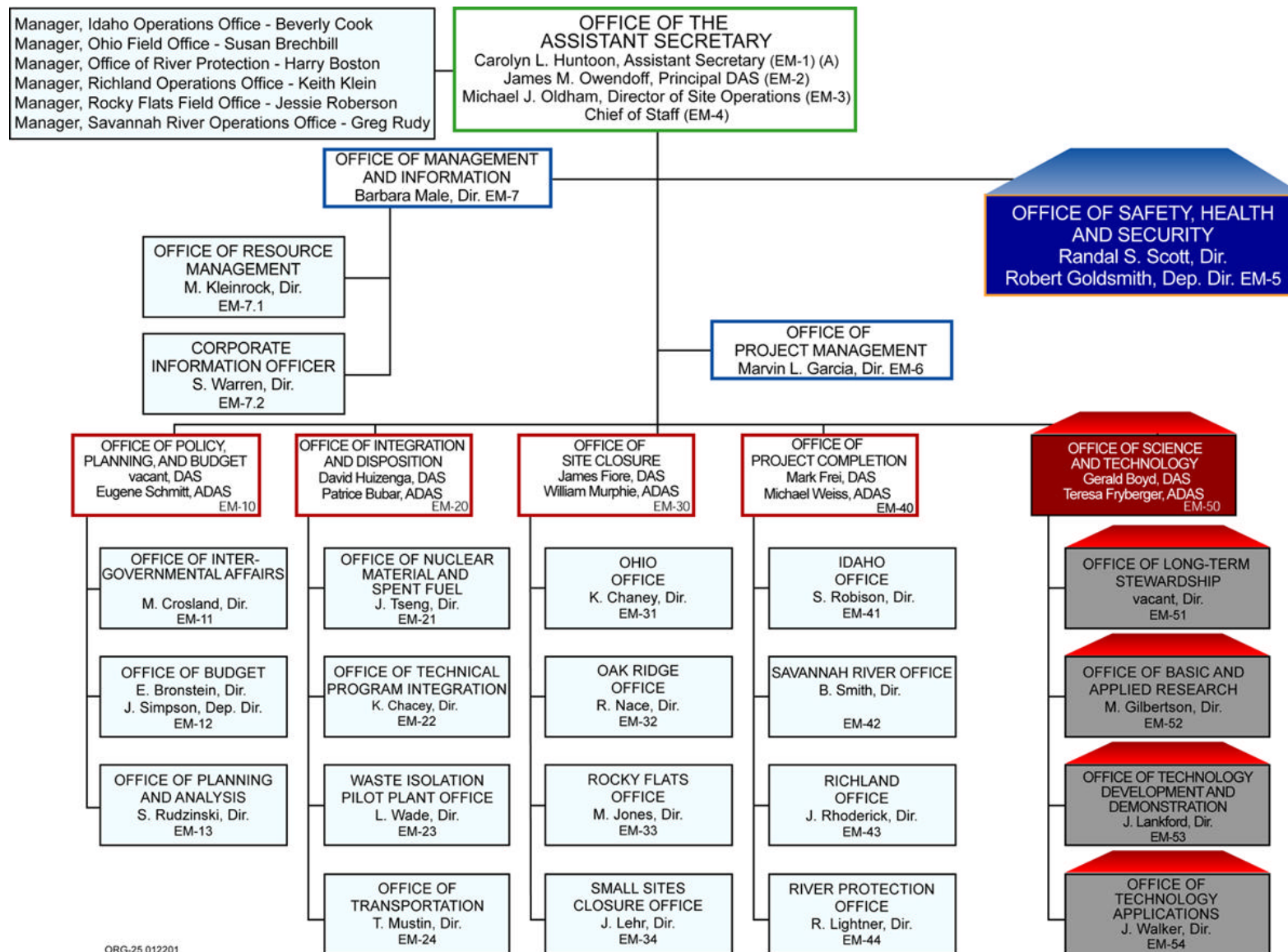
More Remains to Be Done

- Examples of S&T needs
 - 1.7 trillion gallons of contaminated water
 - 40 million cubic meters of contaminated soil and debris
 - 18 metric tons of weapon-grade Plutonium
 - > 2,000 tons of radioactive spent fuel
 - > 160,000 cubic meters of radioactive and hazardous waste
 - > 100 million gallons of liquid high-level radioactive waste
 - Approximately 4,000 facilities for D&D
 - Approximately 2/3 of sites in DOE cleanup program expected to Require Long-term Stewardship

IPABS-IS Data as of 7/12/00
Life-cycle costs in
Constant FY 2000 Dollars



Under Integrated Safety Management, All Line Organizations in the Office of Environmental Management (EM) are Responsible for Safety & Health



EM's Relationship to Safety and Health

- EM HQ (EM-5 and site teams)
 - Develop EM S&H Policy
 - Evaluate EM S&H Performance
 - Provide S&H Technical Support to Headquarters and Field
- Monitoring & evaluation
 - DOE Policy 450.5 (HQ and Field Offices)
 - Site Safety Profiles
 - Monitor Corrective Action Tracking System (CATS)
 - Participate in annual site ISM reviews/updates
 - Contractual agreements reflect Integrated Safety Management System (ISMS)
 - National Safety Council surveys



Background for OST Support of Worker Safety and Health

- Need for worker training recognized early in the EM program; HAMMER authorized in 1994
- OST initiated work with the International Union of Operating Engineers to evaluate hazards of new technologies
- ISM implementation initiated DOE-wide
- OST requested a review of safety and health aspects of new technologies by the Environmental Management Advisory Board (EMAB)
- Recent survey indicates that ~70% of first-time 1999 technology deployments had a moderate-to-high potential for reducing worker exposures to hazards
- Lessons learned from Portsmouth accident, August 2000
- Issued new Safety and Health Policy, January 2001

EM Policy on Occupational Safety and Health in the Science and Technology Program

- Requires technology developers to analyze hazards of new technologies
- Requires communication of hazard information to workers (TSDS)
- Promotes increased awareness of safety in all phases of technology development
- Encourages worker participation in identification of hazards and remedies
- Establishes responsibilities for safety and health improvements
- Website address of full statement and action plan is
<http://ost.em.doe.gov/pubs/TSD/policytsd2001.pdf>

The Portsmouth Gaseous Diffusion Plant Incident

- On August 22, 2000 an accident occurred involving an OST technology deployment project
- A worker was badly burned as a result of mixing crystalline thiosulfate with sodium permanganate solution
- The Manager of the Oak Ridge Operations Office ordered a Type B Accident Investigation
- Four Root Causes were identified
 - Prime Contractor Management failed to analyze hazards and implement control measures for all field activities
 - Subcontractors failed to implement hazard controls and requirements
 - DOE and Contractors did not establish clear roles and responsibilities for the project
 - ISM safety culture not implemented in this instance
- Web address for Type B Investigation Report:
<http://www.tis.eh.doe.gov/oversight/reports/accidents/typeb/0011port/0011port.html>

Brokk Concrete Demolition System (DDFA)

- Applicable to demolition tasks that require operators to be removed from the work site due to radiological, chemical, or industrial hazard concerns
- The Modified Brokk Demolition Machine with Remote Console combines a commercially available BROKK demolition system with the Compact Remote Operator Console (TMS Tech ID 2180) to extend the applicability of the BROKK system to projects that require removal of the operator from the work area due to exposure to radiological, chemical, or industrial hazards

Deployed at: Chicago, Idaho



Vendor: Duane Equipment Corporation,
North American Sales, Inc.

Personal Ice Cooling System (DDFA)

Deployed at: Fernald, Idaho, Nevada,
Rocky Flats, Oak Ridge,
Savannah



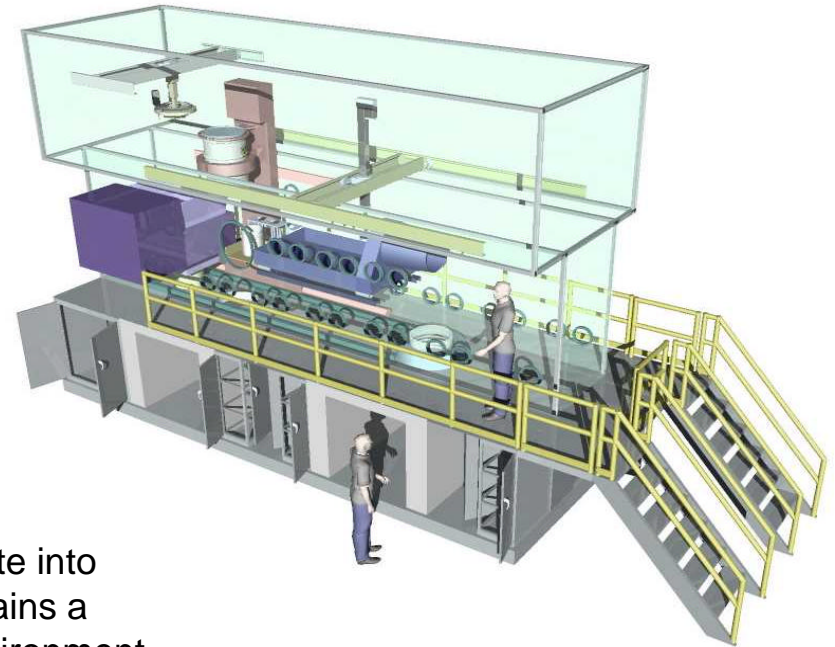
Vendor: Delta Temax. Inc.

- Provide improved worker safety during extreme work conditions
- Self-contained core body temperature control system that uses tap water ice as a coolant and circulates that coolant through tubing that is incorporated into a durable and comfortable shirt or vest
- Increases worker productivity in a heat stress environment while maintaining core body temperature and pulse rate during work activities at Fernald
- Fernald has deployed this efficient, cost-saving, and safety enhancing technology to fourteen other DOE facilities

HANDS-55 Automated Waste Sorting and Characterization (TMFA)

- Remotely removes unsuitable materials from Pu-238 waste drums
- Eliminates worker exposure
- Repackages TRU contaminated waste to prepare for transfer for WIPP
- Composed of four modules, that open the drum of waste and high-density polyethylene liner, remove non-compliant items, and repackage the waste into polyethylene canisters
 - Sorting Module: includes the automated drum and liner opener, sorting table, and vision system for removal of non-compliant items
 - TRU Waste Re-packaging Module: seals compliant waste into polyethylene canisters using infrared welding and maintains a contamination barrier between the glovebox and the environment
 - Process Waste Reduction Module: shreds the old drum and high-density polyethylene liner before being transferred to the compliant waste load out port
 - System Integration and Control Module: includes both the software and hardware that integrates the links and the modules and provides overall control

Deployed at: Savannah River

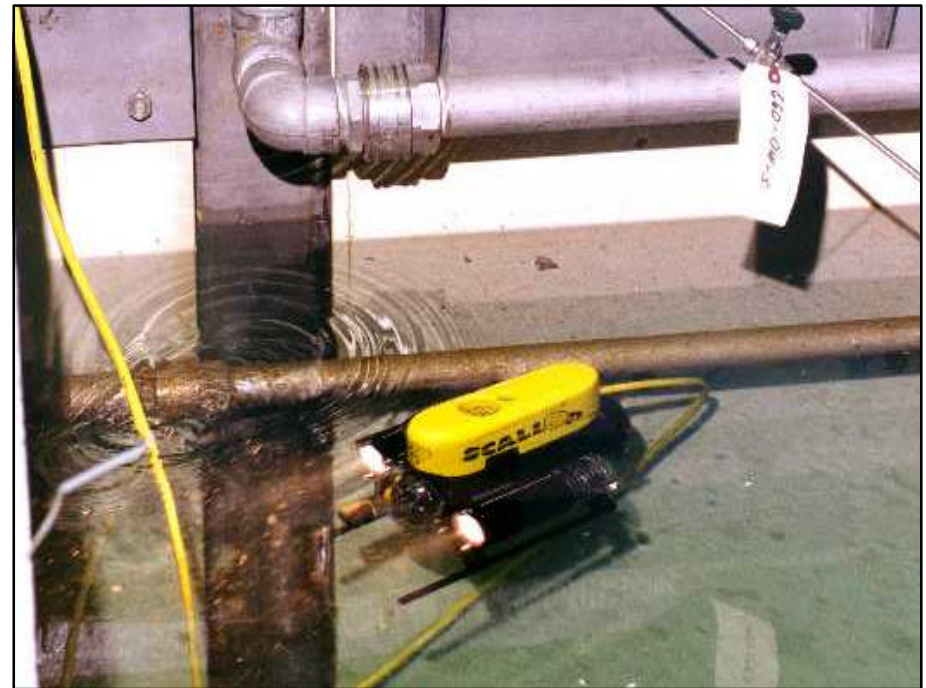


Vendor: Idaho National Engineering and Environmental Laboratory, Savannah River Site, and Hanford

Remote Underwater Characterization System (DDFA)

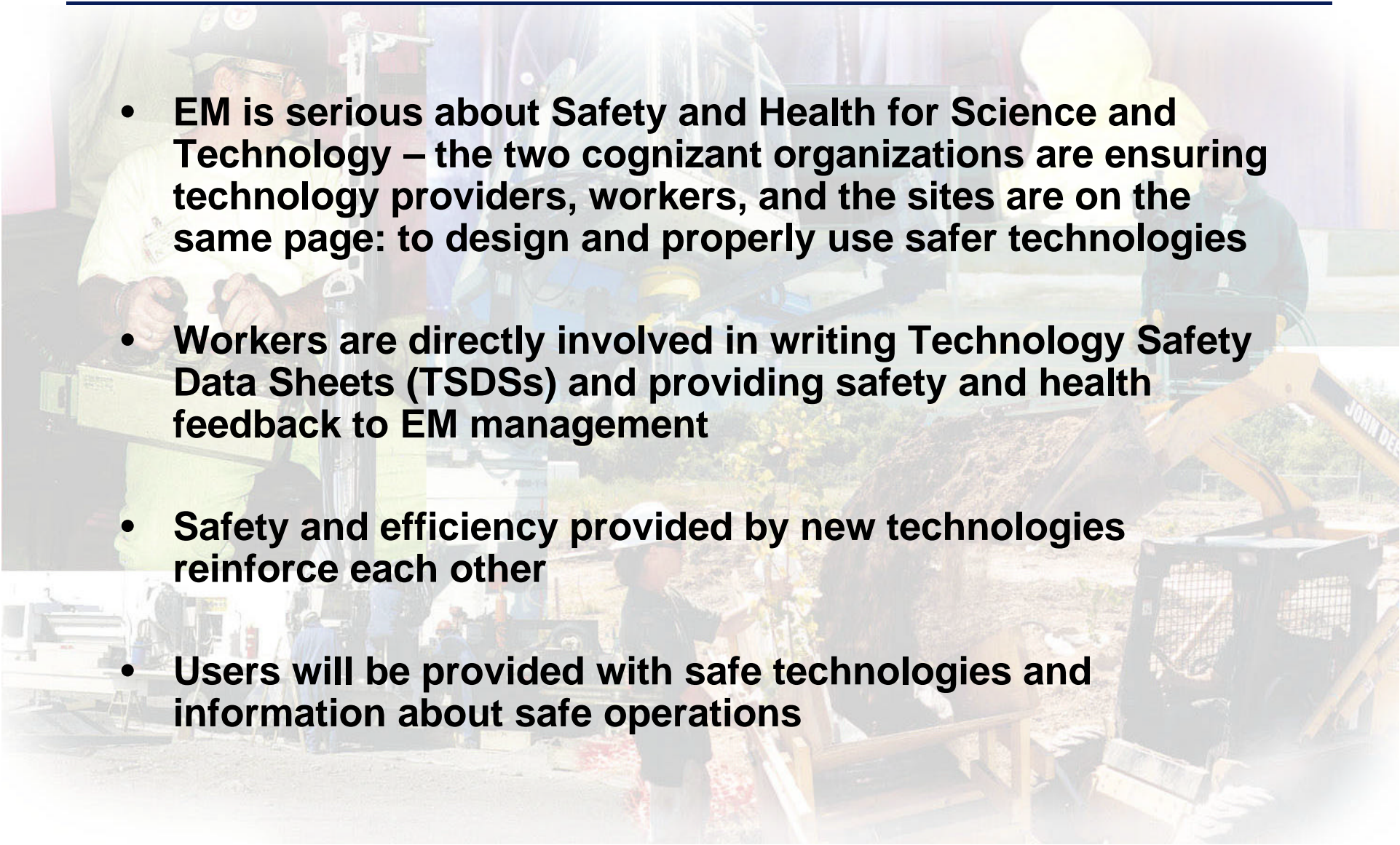
- The Remote Underwater Characterization System is an underwater characterization system. The small size of the vehicle allows it to operate in areas where access is tight or where maneuvering room is limited
- The technology has been used at the INEEL TRA-660 facility to visually inspect a water-filled canal containing two defueled test reactors and to also gather radiological characterization data on the reactors and equipment on the floor of the canal
- Technology is based on a commercially available system and showed advantages over the current baseline technology

Deployed at: Idaho



Vendor: Inukton Services Ltd.

Summary and Conclusions

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- **EM is serious about Safety and Health for Science and Technology – the two cognizant organizations are ensuring technology providers, workers, and the sites are on the same page: to design and properly use safer technologies**
 - **Workers are directly involved in writing Technology Safety Data Sheets (TSDSs) and providing safety and health feedback to EM management**
 - **Safety and efficiency provided by new technologies reinforce each other**
 - **Users will be provided with safe technologies and information about safe operations**